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BIOMETRY.

ITS RELATION TO THE

PRACTICE OF MEDICINE.

[A Paper read before the Section on Practical Medicine of the American Medical Association, at its Annual Session, held in Louisville, Ky., May, 1875, and referred to the Committee for Publication in the Transactions.]

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(Published in THE MEDICAL RECORD, July 17, 1875.)

In the practice of Medicine and Surgery the arts of diagnosis and prognosis are of the greatest practical value. To excel in these arts, much study and great experience are usually required.

The initial step in the treatment of disease or injury is first the diagnosis, second the prognosis. Any art or knowledge that can aid in acquiring proficiency in this direction may be considered as an additional contribution to the science and art of Practical Medicine.

Without a sufficient preliminary knowledge, it would only be empiricism to undertake to treat scientifically any malady.

To be able to make an accurate diagnosis properly, the first and most important requisite is to study the individual characteristics of the person as well as the symptomatology of the disease.

Symptoms vary with the same disease in different individuals, hence a study of symptoms alone is only an imperfect method. Theoretical knowledge may be of value to the purely scientific student, but practical knowledge is absolutely necessary to the successful medical man. The recent graduate in medicine leaves his alma mater comparatively unlearned in the art of diagnosis; his first efforts are nearly guess-work. He no longer receives from his tutors hints and suggestions, and must perforce launch upon the sea of uncertainty and doubt, and perhaps with his very first case discover that he has made a great error.

If he has had practical bed-side experience, and been taught by a competent instructor, his first diagnosis may not be at fault, but if he has had no such practical advantage, then indeed it were fortunate for

the patient to be possessed in no small degree with great viability. But the study of symptomatology alone can never perfect one in diagnosis and prognosis. There needs something more than present symptoms upon which to base a correct understanding of any case,—a knowledge of the physical indications of longevity must enter largely into these elements.

If symptomatology could illustrate for prognosis that degree of certainty which it does for diagnosis, the practice of medicine would be less empirical and more reliable.

From the earliest history of medicine there has always been recognized an indefinable something inherent in the human system, varying in degree and force—this has been variously designated the “tenacity of life,” the “tolerance of disease,” the “natural vigor of constitution,” the “vis medicatrix naturæ”—by which some individuals seem to be able to endure and pass successfully through the most serious of maladies or the most severe injuries without succumbing. Many instances might be enumerated in illustration, but every practitioner will readily recognize such examples in his own experience. How often persons have recovered after injuries, gunshot wounds and exhaustive diseases, who at the time, to all human foresight, seemed beyond recovery.

There is some inherent principle which mysteriously sustains life through these severe onslaughts. We must recognize a “vis preservatrix” and a “vis a tergo.” What this force consists of neither Anatomy, Physiology, Pathology, Microscopy, nor Chemistry has been able to elucidate. We know that man inherits vital properties which are in force from conception to death; that his various components are endowed with lifetimes of variable duration; that, like other living things, some parts decay and perish before others, in regular succession. One day we see the plants beneath our feet spring up, throw out their green leaves and budding flowers, all endowed apparently with vigorous, blooming life; and in a few months, or perhaps days, their flowers, leaves, and stalks fade, wither, and die. These are but prototypes of man. He springs up, flourishes for a time in full vigor, and one by one his secerning organs fail, until at last his physical entity ceases. The vital property has ceased to carry on its secretive power in one organ after another, until it can no longer sustain life. It is not within human ken to describe this vital property.

God breathed into our bodies life, which proceeds under the various laws of our being, so long as they are not violated, until the human machine wears out. It is within our power to cut it short, but not to

prolong it beyond its natural inheritance. We can study its processes, observe the laws which govern it, judge of its force approximately, see its manifestations, and *estimate its probable period*. There are certain *uniform indications* by which we may judge of man's *probable lifetime*. Some men are *endowed* with short life, some with a probable long and healthy life.

Inherited tendencies, habits of living, occupations, observance of sanitary law and residence—all have their direct bearings upon the question of longevity. Acute diseases, accidents, etc., have their life-shortening influences. All of these must be studied in their various relations to length of life.

This study has now resolved itself into a special science, which has been happily designated by the name of

BIOMETRY.*

Its adaptation to the practice of medicine is only one of the many applications of which it is capable.

Its study is comparatively of but recent date. Like every other science its study involves labor and care; statistics are to be collected and compared, its rules and laws elucidated and fixed, to make its practical application of value. When these laws become understood, their application is readily recognized. In medicine, in life insurance, in business, in social life, in a higher elevation of mankind generally, both physically and morally, the application of the science of biometry will be found invaluable. The laws of natural selection, by which physical perfection may be attained, will find in its exposition the true guide-posts by which to accomplish that much desired result. Intuitively we all apply its principles, even without, perhaps, being able to analyze the reasons for our judgment. The physician, by observation and force of long habit, is constantly applying its fundamental truths. He sees nature asserting and exhibiting wonderful endurance and adaptation under the most adverse circumstances, yet he is unable to define or explain the reasons.

In every-day life we constantly apply its principles in our intuitive estimation of our fellows, we judge of men's qualities or adaptation for certain kinds of business, without system or explainable method.

To Dr. T. S. Lambert, more than any other man, belongs the credit of having studied and reduced to a scientific basis the development

* "This is a word whose precise derivation illustrates its intended meaning—from the Greek words, *Bios*, life; *Metron*, a measure." And as "Geometry, from *Ge*, the earth, and *Metron*, a measure, means not merely a measure of the earth, but also the science and art of measuring the earth, so does Biometry mean the science and art of measuring life or lifetime."

and application of this instructive and interesting science. During many years of close application and observation he has fortified its truth by thousands of examples, and so simplified its practical application to the business of Life Insurance, that its laws have become the fixed data in estimating the probabilities of life's period; and as this business, when scientifically and successfully transacted, very largely depends upon a correct estimate and judgment of the probable length of any proposed life, as a matter of security and equity, its application in this direction has already, in the company with which he is connected, reduced the hazard of the business to one of great certainty.*

He remarks in speaking of a lifetime :

“ It includes inception, birth, and the intervening period until death. Life is never found in any other than these relations.

“ It is seen under these different forms in the plant, in the animal, and in the egg. We should expect to see in each of these forms some substance in common, in which the life inheres; and if only one substance is common to all these, life must be dependent upon that.

“ A plant is constituted of woody tissue, and of secretory tissue; the egg, of an amorphous substance and secretory tissue; the animal, of several tissues and of secretory tissue.

“ The deduction is evident, secretory tissue is the only substance common to all living things.

“ It has also a lifetime; it is born, it dies. No other substance is like it in these respects. In fact life exists only in connection with secretory tissue, and when one ceases to exist the other does also, and it is said that death occurs. While secretory tissue acts, life is exhibited; as soon as its action ceases, life is shown no longer; life must therefore be the property of secretory tissue, and its duration must be fundamentally dependent upon their constitution; or lifetime is merely the period during which the secretory tissue can act under ancestral influences, and when from any cause they lose that force, death occurs.

“ Secretory tissue has, therefore, a birth, or a departure from ancestors, which is necessarily related to its decadence, on account of its gradual and irreparable exhaustion of ancestral influences.

“ Secretory tissue is the only kind of tissue or substance that is transmitted from ancestors in either plants or animals, and therefore can,

* The former method of basing the cost upon the general average death-rate of all mankind, as deduced from various experience tables, has, in that company at least, been discarded, and the results already accomplished by the application of this science to the problem has created the greatest astonishment in the life insurance world. Death ratios, from having been ten to twelve per thousand among selected lives, are reduced by this method with almost absolute certainty to less than four per thousand; hence the direct pecuniary benefit to the world, as respects life insurance, is more than three-fold as regards the proper cost to such risks.

and does, contain in itself all the inherited ancestral influences that are transmitted.

“ Different natural lifetimes of different plants and animals must, therefore, be owing to natural or constitutional differences in their secretory tissues, and the necessary antecedent conditions for producing these differences must be found in the antecedent ancestors.

“ There are not only different kinds of secretory tissue, having different lifetimes, in the same plant, but different portions of the *same* kind of secretory tissue in the *same* plant have different lifetimes. This is also certainly the case in animals.

“ In man there are fourteen kinds of secretory tissue, secreting or producing, in their peculiar manner, from the blood, as many kinds of fluids. For example the tear fluid, saliva, gastric juice, the bile pancreatic, urinary, etc. In every kind of organ one or more kinds of the secretory tissue may be found. It may be also said that the six solids of the body are secreted, and the remark would in a sense be true. It may also be said that these, *i.e.*, the bony, gristly, sinewy, nervous, and muscular, as well as the secretory proper, do not only secrete, but exhibit life—for *secretion is living*, and cessation of the power or property of secretion is death. But in a different sense the secretory tissue performs this function of secretion, for it not only secretes itself, as the other five tissues do, but it also secretes some fluid for other uses than are found in itself alone,—the other tissues do not. In the new-laid egg neither of the other five tissues are found, but secretory tissue is there; ere long, the others appear. Each of these can be produced without the antecedent presence of any tissue of its own kind, but secretory tissue never, so far as we know, except in the presence of, and in contact with, secretory tissue.

“ What hinders us, then, from finding all the organs endowed with peculiar lifetimes, dependent upon the lifetime of the secretory tissue or tissues essential to the structure of the organs respectively?

“ It will also be found that all of the secretory tissue in any organ does not necessarily have the same lifetime. *Example.*—In the sides or walls of the stomach, we find, opening into that organ, millions of microscopic tubes, each one distinct from the rest, its interior constructed of secretory tissue necessarily endowed with its special lifetime, which may be shortened, but cannot be lengthened. It would be truly wonderful if the lifetime of all the tubes should be the same. Suppose 100,000 tubes to be endowed with a lifetime of forty years, and the rest able to live to seventy or upwards. Would the person pass the age of forty without inconvenience? The digestion would certainly be impaired, at

least for a time, and doubtless he would always after be incapable of digesting as much as previously. Although he might feel and appear to be as well, yet he could not accomplish as much of some kinds of work as if he had 100,000 more gastric tubes.

"In the stomachs of persons past the middle of life, exposed by post-mortem examinations, it will usually be found that already a larger or smaller number of the gastric tubes have been obliterated; the organ had, therefore, so much less capability of digestion. If we examine these tubes, we find that at the bottom of each the secretory tissue appears in the form of cells, or minute oval bags, which are filled with the gastric juice—that in fact is secreted in them. These cells grow with almost inconceivable rapidity when the gastric juice is needed in the stomach, and, loosened from their birthplace, they come up to the mouth of the tubes and, bursting, yield their contents to aid in the process of digestion. Successive cells pass up from the same origin in the bottom of the tubes. In this general form of cells of different shapes and properties, the active secretory tissue everywhere appears. Each cell has a very short lifetime, and each cell series has its own lifetime. The being born and dying of the cells is continuous, but in each succeeding cell there is a change and a progress, so small with each step, that it is not appreciable with our present means, but so sure and steady that in a certain period the process will necessarily conclude; life will then be no more manifested by that cell series,—its death will be said to occur, and its position will be barren.

"Organs, then, are not units in regard to the secretory tissues that enter into their construction. Each organ is an aggregation or a compound, and in the units, as they may be called, of the organs, there may be, and often is, a great diversity of natural lifetimes, apart from any effect produced by contingent influences. These produce what may properly be called *disease*, *i.e.*, that which cuts short, or tends to cut short, a natural lifetime. But when the death results from the extinction of the natural lifetime of an organ, or a part of it, at its full period, it will also be called disease, if the other organs have a longer natural lifetime and appear to be enduring. But if all of them have reached their natural period of death and manifest completed life, the person will be said to die of *old age*. But there is more frequently old age of an organ, or of part of one alone, than of all of them at once. If a sufficient portion of the secretory tissue of an essential organ be short-lived, a person will die at *its* death, no matter how long lived the other organs may be. But if the short-lived organ is not essential to general life, the use of it only is lost. A person may inherit from a father,

deafness (early death of the ear), or from the mother blindness (early death of the eye), yet live to a good old age; but if he has inherited lungs, kidneys, stomach, or liver short-lived throughout, he dies of the so-called disease—properly speaking, of old age—of organs to which his death is attributed.

“ But they are the resultants of the co-ordinated vitalities and longevities of his organs, which, superficial or deep-seated, directly and indirectly, indicate their respective life capacities to the skilled or expert observer. Hence the difference in the vitality and longevity of men depends, primarily, upon their organic, or rather, tissural constitutions, and upon the relative importance of the shortest-lived organ or part of it in the organism.

“ The inherited lifetime is always the resultant of the conjunction of antecedent ancestral influences, either of which, or both together, may deprave the inheritance below that of either parent stock. This is often the case, while very seldom do the concurrent influences produce a better condition than any antecedent. To the ancestry we must look for the capability of long-living. It is observable that a nose may resemble that of one parent and an ear that of another; the hair may be as red as a grandmother's on the mother's side, and the beard as dark as that of the grandfather on the father's side. The length of the nose may be like the mother's, the breadth like the father's—a single organ showing perhaps half a dozen inheritances, why not half a dozen lifetimes? Why not inherit a stomach from one, a liver from another, or a single such organ from a half-dozen ancestors? One brother, externally, almost entirely resembles the mother; a sister resembles the father so closely that many would say she does not resemble the mother at all. Why may it not be so within, as well as without? It is. It is a fact that a large majority of persons die nearly at the same age as some ancestor or perhaps younger, and of the same class of diseases. There is usually, also, a strong external resemblance. A great-grandfather died of heart disease, at 76, a grandfather at 71, a father at 65; the son strongly resembles the father and grandfather; the son rightly infers that “ he will die still younger of the same disease;” but instead of calling his case a disease, he should say that his natural lifetime will doubtless be shorter than his father's.

“ All parts of the body are originally constructed, and are each moment kept in repair, by the same dominating nervous centres. Those which make the stomach what it is, will produce some other effects which can be seen externally. Each organ exerts an influence, greater or less, directly or indirectly, upon all the other organs—upon those at the sur-

face as well as upon those within. ‘Like causes produce like effects,’ *within* the body as well as out of it. When, therefore, effects are seen upon the surface, the causes may be known to be also acting within.

“Can the internal inheritances, or the constitutional lifetimes of organs, be discerned by external marks, appearances, or indications? Certainly, in most cases.

“In the first place, by studying the necessary physiological relations of the organs of the body and the influences which they exert upon each other; and in the second place, by observing the external manifestations of the body with a discerning eye, the external indications of internal conditions and of the constitutional lifetimes of organs can soon be practically learned.

“*Example.*—It will be found that the kidneys, for good physiological reasons, have intimate relations with the skin, and that their conditions, liabilities, and probable lifetimes are discerned more readily, in fact through corresponding peculiarities of the skin, than they could be by looking directly into them, which cannot be done during life.

“Almost every one is familiar with various facial expressions or constitutional peculiarities that indicate present or future health of the various organs. To see more, only requires a closer observation, especially if guided by the light of a preparatory study of physiological relations.”

The laws of Biometry are abundantly illustrated by heredity. The histological characteristics of persons when studied under these laws present the most convincing proofs of the status of Biometry as a true science. In the examination of the ancestral histories of thousands of individuals, the deductions therefrom establish the fact that certain measurements can be relied upon almost infallibly, by which to read backward from the person the life characteristics of the ancestry, and hence, inversely to determine the individual’s life probabilities. So, when we find a person presenting these general measures in due proportion, we may judge, almost invariably, of his powers of resistance or natural viability. If so be he is descended from a healthy, long-lived stock of both parents, almost without exception it will be found as a rule that he is both healthy and long lived, able to endure much hardship, resist grave maladies, and to recover from the most serious injuries and great nervous shocks.

Again it is found from observation that where there has been long and vigorous ancestral stock upon one side, with perhaps short life engrafted from the other, such person will arrive at a period of partial decline, with ill health, and subsequently recover, living on and be-

yond this deflection, being sustained by the vitalizing secretory influences of the longer-lived ancestor. A moment's reflection will call to mind many such instances, as when persons have remarked that at a certain period of their lives they were suffering from some special disorder, from which after a time they have seemingly entirely recovered and enjoyed sound robust health. Many such instances must have occurred in every medical man's practice.

That longevity is a resultant of heredity no one will dispute, and that it does not depend upon race, climate, mode of life, or special observance of sanitary law, is also a self-evident fact. Those who have inherited it can, seemingly with impunity, almost defy all sanitary law, and yet continue to live up to and beyond the allotted limit of "threescore years and ten," while those who have not inherited long life cannot by any system of life, or observance of the laws of health or process of prolongation, protract their naturally short-lived inheritance. Of course we must admit that abuse can and does shorten the lives of the naturally long-lived, and acute disease or great injuries cut them off suddenly; but the rule holds good that the naturally long-lived inheritance affords that innate power of resistance which will carry them through disaster and disease such as will certainly destroy the naturally short-lived.

The probably short-lived may be equally healthy and robust, and able to endure almost as much, while that life lasts, as the longer-lived, yet it seems to be the fact and nature's law, that the period of existence has had its limit set beyond which no process of prolonging can avail to carry it beyond the allotted period. The secerning elements of the vital organs have their limits, and hence control the existence of the whole organism. We see this illustrated in almost every organ of the body; certain parts cease to perform their functions, die out; and, so long as these are not vital, life continues, although it may be in a restricted sense,—as, for instance, persons become bald or partially so at a certain age; they say the same occurred in their ancestors at about the same age; others find their digestive powers failing, and remark the same thing as having occurred in their parents or grandparents. The secretory vitality of these parts is then seen to follow the law of heredity.

Without an inheritance of long-lived secretory powers it is in vain to expect any great degree of longevity in the descendants.

In estimating the probability of a lifetime it is entirely useless to depend upon the general average of human life. This rule holds good only as respects human life at large, and therefore we must look beyond life statistics to sum up the problem. *With the duration of individual life general average holds no command.* Ancestral longevity will not

obey the general average law, but defies death in many shapes, holding on tenaciously until the machine, actually from rust and the interstitial deposits of years among its most delicate parts, wears them out. Even though many times wrecked, battered, shorn of all their sails, and rudderless, their sound-timbered, well-built organs ride out the storms of life to an extreme old age.

The important question then arises: Are there any well-marked indications, externally manifested, by which it is possible to judge of men's powers of resistance to the destructive influences of life?

Are these indications so palpable that ordinary persons can judge by the personal characteristics sufficient to estimate the probable chances of recovery, or in other words of the probabilities of life in disease, in different individuals?

These questions may be answered with confidence in the affirmative.

If such is the fact, then it must be admitted we have at hand one of the most certain means of deciding upon the prognosis, and the science of Biometry comes in as the grand marshal of symptomatology and diagnosis. Our treatment of disease can be regulated accordingly. It will not be necessary to fill the human stomach with the contents of the apothecary shop in order to find "something that may hit the disease." By reason of the certainty of our knowledge we can inspire our patient with the hope that is within us, and when he is so inspired half the battle is already won. Who has not seen the brightening eye, the stimulated courage, the grand fight of an unconquerable will, which hopefully and patiently has resisted the almost overpowering death struggle, when his doctor, judging from his own intuitive perception of the great tenacity of the life before him, has assured his suffering patient that he will recover?

Does it not occur to every practitioner, how many times in his own practice the thought has instinctively forced the conviction upon him that the patient would recover, and again with another patient his hope has sunk from seeing there, no sustaining vitality to aid in the desired recovery?

True, some medical men take no note of such conditions; they hope and fear for all equally and without special discernment.

But most physicians will recall scores of instances in which they have been favorably and unfavorably impressed by different patients, and mentally, at least, prognosed their cases accordingly.

Indeed, so decided and correct is this judgment with some physicians, that they and their acquaintances are prone to consider their off-hand conclusions at the bed-side as almost, if not quite, intuitions.

Let us pause for a moment and reflect upon these facts. Is it not a little singular that they have not more strongly and distinctly arrested our attention and so fastened themselves in our minds that we should draw from them the instruction which they are capable of yielding?

When we ask ourselves or others why these impressions, of decease of one patient and recovery in regard to another, how indefinite and unsatisfactory the answer? Ought we not to be able to give a reason for the faith that is within us? Are not our impressions wholly dependent upon the appearance of each patient respectively? Cannot these appearances be defined, be described in detail completely?

Cannot these appearances be analyzed, and the relation of each detail to disease or recovery be made so clear and conspicuous that even the tyro in medicine may have a reliable guide to a correct prognosis in every case? Shall we say, as is often said, that there is an indefinable something in the appearance of the patient that impresses us thus or so, we know not how or why?

Too long has this mysticism been allowed to govern the medical profession. Too long have we looked upon patients as through a glass darkly, and have envied the select few who seemed to have a mysterious, instinctive insight into the prognosis, as if gifted beyond their more plodding fellows, the mode of which was not to be described by them nor learned by observing their methods.

These erroneous notions must be laid aside, and we must see to it that prognosis is to be acquired in a scientific manner, not alone simply by feeling the pulse, looking at the tongue, taking the temperature, or other similar means, but by a thorough detailed analytical observation of all the signs and indications that patients present in the size and color of some or all parts of their bodies.

Another very important part of our prognosis will be dependent upon our having a correct idea upon the following point; that our organs are not units but communities, each member or element of which is nearly, if not quite, independent of its neighbor; for example, each gastric tube or gland in the stomach is, or may be, an independent unit, so far as its longevity and liability to disease is concerned.

Virchow has well said, that a single cell may be independently diseased.

Dr. Lucas in his *Traité Physiologique et Philosophique de l'Hérédité Naturelle* remarks as follows: "The *average of life* plainly depends on locality, hygiene, and civilization; but the *individual longevity* is entirely exempt from these conditions."

"Everything tends to show that long life is the result of an internal principle of vitality which privileged individuals receive at their birth. It is so deeply imprinted in their nature as to *make itself apparent in every part of their organization.*"*

The foregoing statement of Dr. Lucas is also quoted with emphatic approval in a recent work on Heredity, by Ribot, of whom Dr. Lambert remarks that he "may be justly regarded as the ablest of European writers upon this subject."

This interesting and practically important idea of the different lengths of life is well illustrated in the hair glands on different heads, not only, but on the same head. Some hair glands inherit a life of ninety years, while their fellows terminate their inherited longevity at twenty years or under.

As before remarked, how often we see baldness follow ancestry, even in quantity and position, and the question cannot be avoided: Does not analogy legitimately argue that a similar condition should be expected in every other organ of the body possessing a community of glands?

It is not enough that we analyze the appearance of patients, so that we can discern which *organs* are affected, but we should be able to recognize to what *extent* they are impaired, how large a *portion* of them has reached the natural terminus of the longevity belonging thereto, and which is bound to die then and there. If this portion is large enough, and belongs to a sufficiently vital organ, to commit homicide upon the other organs of the body depending for life upon the dying portions, it matters not how long-lived the other portions or the other organs may be by inheritance, they must then and there die from inanition. Marasmus is an apt illustration of a homicidal death by this method.

In such cases there will be at first a general appearance of much vigor, and a man of but little observation would be likely to prognosticate recovery, not remembering that "the chain is never stronger than its weakest link." We must observe the weak spots. Then shall we find that many more deaths are produced by natural unavoidable causes, namely the termination of the inherited naturally short life of some organ or portions of it indispensable to the continuance of the whole, than we usually have supposed; whilst again many recover from severe attacks on account of the inherent longevity of such a proportional part of the diseased organ that there really was no danger of dying even under the worst kind of treatment.

* The italics are ours.

Will not these suggestions account for the apparent success of all kinds of quacks and ignorant pretenders everywhere and in all times?

Will not the consideration of these two fundamental ideas of Biometry—first, that each organ is not a unit but a community of parts in regard to longevity and liability to death ; and second, that the inherent longevity of any considerable part of the body can be discerned through the signs and indications that its various external parts manifest—will not, I repeat, these points of Biometry make the prognosis of disease much more interesting and satisfactory and practical in its treatment than has ever been the case? Will it not be gratifying to exchange the unsatisfactory impressions, intuitions, or guess-work, as some are inclined to call it, for a rational, reliable method governed by fixed law?

All who have carefully watched the progress of disease must have been convinced that there is some general law to which these instinctive intuitions of many physicians point.

That fundamental law is found only in or rather constitutes the science of Biometry. Not only do all beings endowed with life tend, in obedience to the law of heredity, to repeat themselves in their descendants, but also in their physiological and pathological characteristics as related to health and disease, follow the same laws, or rather the broader one, of which the signs and indications of longevity are the expression.

But how may we discover the indications by which to judge in any given case of the probable lifetime naturally belonging to it?

By instituting comparisons or observing certain general configurations uniformly found in a very large number of individuals, it has been found that certain universal conditions pertain to the long-lived and to the short-lived exclusively. These are found in the size, shape, proportion, color, and capacity of all parts of the body.

Thus we can compare persons descended from long-lived with those from short-lived ancestors, and notice the differences which, as a practical fact, are *found to be well defined* ; for example, the following: the comparative size and shape of the head ; the colors of its external components, as hair, beard, eyebrows, eyes, shape and size of nose, lips, chin, and features in general, and their comparative relative measures ; the trunk with its relative proportions,—it may be here remarked, that the length has even a more important significance than the circumference ; for when the proportion of the trunk is in excess of one-third the height of the figure, we may be assured of corresponding great life, tenacity, and capacity. A comparatively long trunk gives us a form

that affords room for the functions of respiration and digestion, the two most important life-sustaining functions of the whole organism.

Given good respiratory capacity and good digestory apparatus, may we not prognose a healthy, vigorous constitution?

In looking over these indicative points, especially in the sick man before us, we need also to inquire into his ancestral characteristics. What has been, not the average, but the special duration of the antecedent lives of his progenitors? What were their peculiar diseases, family diseases so called, and of what diseases, and at what ages did they die, if dead?

Here lies the clue to the factors of the disease under observation in any case.

By observing and applying the laws of Biometry in the treatment of disease, the medical man places himself in the front rank of the benefactors of mankind, and he is also thereby enabled the better to apply the great laws of hygiene for the benefit of his patrons. Observing the temperament, the tendencies to some special form of disease, the predispositions, he is qualified to extend his warning advice regarding Occupation, Residence, and Habits of life, and to suggest at what period of life may be expected certain ailments, and the necessary precautions to avoid, if possible, their worst effects.

Thus in applying the laws of Biometry we may not only be useful to our fellow-men in curing disease, but also as conservators by our forewarnings.

We arrive then at this grand conclusion, that when we come to study the laws of Biometry, we are no longer at a loss to understand the fundamental reasons of those apparent intuitions; they need only to be analyzed to give us the true indices of the viability and power of recuperative energy inherent in our patient. Mysticism is replaced by true science, which, when earnestly studied, gives us the grand truths of Biometry sustained at every point by Heredity, Physiology, Pathology, and actual results.

Having exceeded the allotted time which has been already extended beyond the limits usually accorded to papers, I will omit reading the details of the signs and indications which have been found to be so uniform in their general features as to be reliable indices of longevity (both long and short), and hence useful as indications having relation to the prognosis and diagnosis of disease.*

* In another Edition the signs and indications of Biometry will be treated of in full. Please send for the complete edition, to MOREAU MORRIS, M.D., American Popular Life Insurance Co., 419 and 421 Broadway, New York City.

PART SECOND

OF PAPER ON

BIOMETRY; ITS RELATION TO THE PRACTICE OF MEDICINE.

Read before the American Medical Association, at Louisville, Ky., May, 1875, by
 MOREAU MORRIS, M.D.

BIOMETRICAL INDICATIONS.

The indications of longevity as defined by Biometry may be presented under three general heads or measures: Size, Form, Color, to which may be added texture or quality of the Tissues.

No one of these, *per se*, can be relied upon usually, however, but combined they present evidences, each of its kind, by which we may very uniformly arrive at a just conclusion.

There are numerous instances where it will be found somewhat difficult to decide from which ancestral line the life-determinating qualities descend; for example, when there is great symmetry of bodily form, color, of its components, and nearly equally proportioned temperaments. In such cases we require not only all the aid to be derived from accurate measurements of what may be designated as standard parts of the body, but also some little practical experience, which can be easily attained by comparing those known to have long-lived ancestry with those known contrariwise, also by observing the special indications of those now living who have attained great age.

Two ways present themselves for studying the indications of lifetimes; one by studying the human constitution, and thence deducing our inferences; or we may seek empirically among the long-lived for such indications as are common to all of them, and so comparing them with the indications and measures shown upon those who have short-lived families. Practical experience has taught observers, in studying these indications, the truth of the old adages, "Blood will tell," and "Like begets like."

SIZE.

Under this head we may include height, weight, length of trunk, its size and expansibility, its general conformation, and its relative proportions to the whole body, size of neck, limbs, hands, feet, and proportionate measures of the head—the grand central point of power controlling the whole organism.

FORM.

This includes not only the general configuration of the body as a whole, but the form of special parts also present indications or measures of a tendency to special diseases, likewise certain forms of different parts of the body are found to be usually associated with long or short life.

COLOR.

This is the least reliable, *per se*, of the three heads or measures, still it affords very material aid in the general make-up of the estimation of a human life.

The uniform color of a healthy skin may be temporarily changed, depending as it does upon various causes, which may be operating externally or internally ; either confinement in-doors, out-door exposure, some defective condition of alimentation, assimilation, or some disease or constitutional idiosyncracy. There are parts of the body, however, which always present naturally a uniform color, for example, the hair, the beard, the eye-brows and lashes, and especially the iris of the eyes, which, when studied with reference to constitution, exhibit most reliable indices.

When carefully observed it will be found that the iris is tinted with but two basic colors—blue and brown ; each of these two colors present us with a great variety of shades. When there is a thorough admixture of these two, so that neither color predominates, we have the true hazel, by some called grey, but when there is an admixture, in which one or other of these colors predominate, it may be said to be a hazel of the respective tint. The varieties of shades may also be modified by nervous influences, causing the eyes to sparkle, look dull, heavy or placid, as the case may be. Black eyes, usually so called, are really only very dark brown.

In the special study of Biometrical indications, under these three general heads, and their sub-divisions, it may be discovered that we have introduced a practical application of physiological knowledge, any radical departure from which immediately presents to view some pathological condition, the gravity of which, we may premise, oftentimes, by the nature of the organ or part of the body through whose indications we are thus made cognizant of it. In connection with these visible indications we are frequently much aided by the natural instinctive feelings of the man. The gait, the peculiar habit, the natural temperaments, the uniform haste or moderation or slowness in all the acts of life, often afford the strongest corroborative evidences of certain constitutional peculiarities, and a semi-consciousness of a naturally long or short life. For, each kind—to wit, naturally long or short life—has its peculiarities readily distinguishable by the practiced eye.

In the study of a human life and its probable expectation ; in estimating its qualities of probable endurance through bodily injuries or grave diseases, this analysis of its components, these observations of all the indications which distinguish it, can, with very little practice, afford most reliable data whereby the skilled physician may be enabled synthetically to diagnose and prognose his case with almost the certainty of fixed law.

The secerning elements by which life is sustained, have their limits, and those possessing only short life cannot produce or sustain a long-lived being. True, different organs, necessary or unnecessary to prolonged

vitality, often inherit different life-times, but there is a definite period for each, and if, perchance, a vital organ has inherited a short life-time, it matters not what degree of life-time may have been inherited by other organs not essential to life, the whole life-time of the person must cease with that of the vital organ. So we all know, when a person is attacked in some vital central organ, as in the systemic circulation, or the digestive system, or the great ganglionic network, by any incurable or irremovable affection, the whole organism must succumb to its fatal influence, however free from the special disease every other organ of the body may be.

In view of these facts, the records of the causes of death among the immediate, and the remote ancestors as well, become of very great importance.

We do not by any means ignore the fact that the progress of medical science has taught us that there are certain tendencies to disease transmitted from one generation to another, and often we may observe how these transmissions appear inscrutably to skip a whole generation, although having persisted through several preceding it, and again crop out in the one following after it. This apparent anomaly may, perhaps, be explained when we come to know more exactly all the true signs and indications of Biometry. Already they afford the clue, which seems to have been overlooked in the study of these transmissions, to the fact that certain predominating influences inherent in one ancestral line have overcome, through fortuitous selection, the tendencies to certain forms of disease in the other.

These facts seem to be better understood, if not scientifically, at least from practical experience among animal breeders, who make rigid selection and guard with jealous care any admixture of defective or inferior stock with the best, carefully rejecting any animal, for breeding, which exhibits the least sign of constitutional disease or defect in any organ, while they cultivate and propagate only from such stock as gives evidence and sure indication of a sound, healthy constitution ; or by careful selection promote certain desirable qualities. In this connection, may we not learn a lesson from these acute and careful observers of animal life, who learn to distinguish defective or constitutional ailments by the outward signs, manifestations, and indications, which these mute animals present ?

Another point of the utmost importance in the practical application of this science, is the certainty with which it can be determined from which line of ancestors, or, in common parlance, from which "side of the house," male or female, any man derives his strongest constitutional tendencies to any special disease. If we can settle this point, we shall be enabled to determine with great accuracy the probable amount of danger to the individual, in whose family history certain transmissible tendencies, such as naturally excite the greatest anxiety, may have been exhibited ; and we

would go even farther, asserting that it is possible to prognosticate, by means of this science, which individual member of any given family will most probably be liable, and what others will not be in danger of this affection.

It may not, perhaps, be possible at the present day to apply practically the knowledge thus obtainable in the wise selection of human propagators, but it may become possible, through early education, and inculcation of physiological law, so to modify at least, by proper selection, the constant transmission of tendencies to certain diseases as are known to be continued only through ancestral influences.

Indeed, may we not predict that the progress of knowledge and civilization will yet compel the desires and passions of the individual to yield to the greater welfare of society at large, in the selection of life-partners through whom future generations are to be rendered miserably diseased or physically perfect? Are such diseases as Insanity, Consumption, Scrofula, Syphilis, Cancer, and may we not say, Intemperance, always to be looked upon as ineradicable necessary evils to the human race? How few are the years, comparatively, since Small-pox, Scurvy, Cholera, Typhus, Typhoid, Yellow and Relapsing Fevers, were supposed to be inevitable, uncontrollable diseases? Yet the progress of Hygiene has already almost "stamped out" these from among enlightened and civilized communities.

To the medical profession belongs the honor of staying these great human destroyers, and to it also belongs the greater duty of impressing the necessity for still further arresting the propagation of those transmissible, constitutional life shorteners and destroyers of the human race.

Just here we may be permitted to pay that tribute, justly his due, to T. S. Lambert, M.D., LL.D., a practical physiologist, and author of works on Physiology, Longevity, and Biometry, and one who, by long years of observation and patient study, has brought this new branch of scientific inquiry to its present stage of perfection. To him belongs the honor not only of originating the study of this as a distinct branch of science, but also of putting its truths to that practical test, which its application in the conduct of an important business must necessarily either prove true and valuable by its success, or condemn as worthless by its failure.

Perhaps no more severe test could be applied to any proposed system which in its infancy was open to so much criticism, to say nothing of the usual derision bestowed upon the development of any new idea. But its freedom from any of the *isms* of the time, and its basis derived from fundamental physiological law, only required a practical application of its truths, with successful results, to establish it upon a firm foundation, as a new and successful development in the progress of scientific inquiry, and hence we may welcome it as really a new branch of science.

In the practical application of Biometry to the practice of medicine

the personal indications of longevity become special points of interest and study, that the proper inferences may be drawn with reference to the innate natural power of resistance to the destructive influences of disease, or that we may be enabled to judge of the degree of viability possessed, which may overcome the depressing effects of serious injuries. Dr. Lambert remarks: "It is easily observed that in many families there is such a difference in the longevity of the different members, that the application, for any practical purpose, of the 'family longevity,' or of the 'family expectation,' to the individual members, would be very inequitable." "In some families, for example, all are long-lived and strong except one, who is puny, sickly, and dies young. His short age will serve to reduce their 'expectation' if an average is taken; but their probabilities of life will not be lessened because one such child is born in a family. Again, in other families all the boys are robust and the girls weak; or *vice versa*. Or in other families some of each sex are frequently sick, while some are rarely unwell."

"It will be observed that in such families the ancestral blood on one side is long-lived, and on the other short-lived, and accordingly as the children 'take after' one side or the other, so will their vigor and longevities be."

Hence the personal indications not only of longevity, but such as indicate which "side of the house" a person "takes after," or from which line of stock he inherits his strongest vitality, becomes a question of supreme interest.

The question, then, of the probable "expectation" of a given life, and of the natural powers of endurance of that life with reference to disease or injury, belongs quite as much to the domain of medicine and surgery, as to that of life insurance.

Again, personal indications may establish the fact, personally unknown to the party, of his descent from an entirely different line of ancestry, from that which he supposed or has been taught to believe. "History abounds in illustrations of surreptitious infantile exchanges; imputed parentage is not always reliable."

Do we not almost instantly judge of a person's health upon looking at his face? Expressions of countenance, peculiar moans, or cries of childhood, are all recognized by the skilled physician as indications of special ailments. The pulse indicates not only the number of pulsations, but by it do we not estimate the probable conditions of the hidden nerve centres controlling the heart's action? Is it feeble, strong, forcible, intermittent, regular, or tremulous? By these conditions we judge of the general nervous and physical condition quite as much as of the degree of circulation.

As great longevity is synonymous with great vitality, viability, and good, sound, healthy constitution, we naturally proceed in the study of

Biometry to fix upon such indications as are found to pertain uniformly to the long-lived.

The three heads first enumerated, viz : SIZE, FORM, COLOR, with TEXTURE or QUALITY of TISSUE, give us a basis or groundwork for general observation. The sub-divisions of these will give us in detail the special indications.

First with reference to Size. Naturally, as we cast our eyes upon a person we are impressed with his comparative size as a whole. Critically we now proceed to analyze or compare the several parts, and their relative proportions with each other, and to the whole. We observe the height, weight, and if the members, the head, neck, shoulders, arms, trunk, and legs, are well proportioned. We notice the degree of muscular development, its proportion to height and weight ; the *posé* of the head and neck upon the shoulders, and of the latter with reference to shape and position relatively to the trunk and spinal column ; we particularly note the form and proportions of the trunk, including the chest, its expansion whether equal, from a central point in all directions, and the abdominal capacity. Notice more especially the proportionate length of trunk to the whole body ; for a trunk exceeding in length more than one-third the whole height is a very strong indication of longevity. Within it lie, with one exception, all the most important vital organs of the whole mechanism. The functions of respiration, circulation, digestion, assimilation, secretion, and of elimination principally, are all performed within its cavity. If this be contracted, shortened or distorted, some one or other of these essential functions is impeded in its full operation, and hence that uniformity so conducive to the highest state of perfection in the processes of life, is unduly disturbed, resulting in the more or less rapid wearing out of some one part of the human mechanism, before the others. The measure of the length of the trunk should be taken sitting or standing, and usually varies about half an inch in these relative positions. If taken while seated, the points selected are from the top of the sternum to the chair-seat, the body being held erect ; if taken standing, the line from the 7th cervical vertebra to the end of the coccyx, gives us a standard measure. The latter measure must be considered the most reliable. The capacity of the chest, its degree of expansibility and contraction are also to be noted ; not only its lateral, but also its vertical and equable bi-lateral natural movements, during the natural acts of respiration, as well as during its forcible movements. A difference of about *three inches* in its circumference between contraction or exhaustion, and its full expansion, will usually indicate good respiratory power, when in connection therewith is freedom and fullness in all directions. The movements of the chest being solely produced by muscular action, partly voluntary and partly involuntary, a strong and well developed muscular system, and especially of the chest, is to be regarded as indicative of good vitality and longevity.

Men have succeeded in forcing a still greater expansion, but we should

judge by the natural movements rather than by those that are forced. Again, the downward movement of the diaphragm affords more or less chest capacity, usually observed as markedly different in the two sexes, owing largely to dress.

The indications of the neck and limbs afford some guides also. Too much importance has been attached to the size and length of the neck, *per se*. Observation has proved the fact that persons with long and slender necks are not exempt from apoplexy, nor are those with short and thick necks any more liable to it. A disproportion of this part as with the limbs when either too short or too long would indicate short life. But a person having short thick thigh and arm, with medium height, and a proportionately long trunk, is almost sure to live to old age.

A large hand and foot, short fingers *well webbed* between first and second joints, and high instep, are very decided signs of long life: Whereas, long slender fingers, deep cleft, with large joints, nails clubbed or very convex, indicate short life and constitutional tendencies to disease.

The *Head*, containing the great central telegraph station (if we may use the term), gives us in detail, the most decided and reliable indications regarding both the ancestral and the personal, probable longevity. All other parts of the body may be termed simply supports or dependencies, governed more or less through the nervous connections by this great central power.

The proportionate measures of the head with its facial configuration, color of hair, beard, eye-brows and lashes, may be esteemed as of leading importance. Those portions of brain—the basilar—which lie between the temporal and frontal bones, are found to be principally the organizers and life sustainers, from birth to death, and upon their nervous constitution greatly depends, apparently, the life giving and sustaining force necessary to great longevity.

The examination of many thousand instances by actual measurements in connection with the ancestral histories of each, now on record, seems to establish the fact that these head measurements are reliable, as a rule, in this direction. For instance, a head measuring $5\frac{1}{2}$ to 6 inches or over, (caliper measure,) on a horizontal plane through the temporal fossæ, where the cranial walls are thinnest, is found to have had an ancestry on the father's side of from 70 to 90 years of age, and frequently still older, and if the caliper length of the line from the naso-frontal articulation to the external auditory canal measures $4\frac{3}{4}$ to 5 inches or over, we may be assured that there is an equally long-lived maternal ancestral stock. Other equally reliable indications from the color of hair and beard have been found uniform, as, when the *beard* is of a *dark*er or *more reddish* color than the hair, the constitutional peculiarities and tendencies descend the strongest and most predominating from the *paternal line*, while, *per contra*, when the *beard* is seen *lighter* than the *hair* the *maternal* stock prevails. These differential measures and colors are again corroborated by the

general form of features and bodily make up. With a nose comparatively large, and with wide spreading alæ; with well shaped ears having firm elastic rims and long lower lobes; with broad square shaped lower face, long upper lip and broad chin, with the masseter muscles well developed, and with broad horizontal shoulders, there can be no mistaking the fact, in connection with the head measure, the hazel eyes, and darker color of beard before mentioned, of the strong predominating paternal ancestral influences governing and controlling the constitutional tendencies of the individual.

On the other hand, we recognize the predominating maternal constitution in almost the opposite characteristics, viz., head narrow between the temporal fossæ, with longer measure comparatively from the naso-frontal suture to the external auditory canal, having thin tapering lower jaws, contracted nose, medium-sized ears, and with beard lighter than hair, in connection with narrow-sloping shoulders, broad hips, knock-kneed legs and generally loosely-jointed, and with the muscular development usually not so strong or decided, as in those whose life characteristics have been derived from the paternal stock.

What is called "Powell's life line," is a measure taken by passing a string around the head, touching the outer upper orbital arch over the eye-brows and the occipital protuberance. From this somewhat oblique line, is drawn a perpendicular line to the external auditory canal; the short or long measure of this line adds strong corroborative evidence to the other measures already enumerated. Anything under one inch indicates short life, and over one inch a proportionately longer one.

The correlation of the head and trunk measures with a high longevity among the ancestors, is well illustrated by the following examples taken promiscuously from a large number of instances now on record.

By these it may be observed that the trunk measures are in each instance more than one-third the height, and those of the head large; and it may also be observed that there is a remarkable absence of any evidence of transmissible constitutional disease among the ancestry, a fact also usually observed in long-lived families. While on the other hand, by noticing the family records of the examples given of short measures, the contrary fact appears; hereditary constitutional diseases seem to prevail through succeeding generations.

EXAMPLE 1.

NAME.	AGE.	MEASURES.					
		HEIGHT.	TRUNK.	TEMPORAL FOSSE.	NASO- FRONTAL, AND AURAL.	POWELL'S LINE.	BEARD.
W. E. V.	26	5 ft., 9 in.	25 in.	5 $\frac{1}{8}$ in.	5 in.	1 $\frac{1}{2}$ in.	Darker than hair.

ANCESTRAL AND FAMILY RECORD.

ANCESTRY.	AGES, LIVING.	AGES AT DEATH.	CAUSE OF DEATH.	COLLATERAL BRANCHES.	AGES, LIVING.	AGES AT DEATH.	CAUSE OF DEATH.
Pat'l G. F.,	50	Accident.	Pat'l Uncles,	50, 70	14	Drowned.	
" G. M.,	100	Old age.	" Aunts,	70	70, 73	Unknown.	
Mat'l G. F.,	100	" "	Mat'l Uncles,	89	98, 90	Old age, Cancer.	
" G. M.,	94	" "	" Aunts,	87	90, 90	Old age.	
Father,	65		Brothers,	30, 35, 40			
Mother,	66		Sisters,	33			

EXAMPLE 2.

NAME.	AGE.	MEASURES.					
		HEIGHT.	TRUNK.	TEMPORAL FOSSE.	NASO- FRONTAL, AND AURAL.	POWELL'S LINE.	BEARD.
L. F. P.	62	5 ft., 10 in.	25 $\frac{1}{2}$ in.	5 $\frac{1}{8}$ in.	5 in.	1 in.	Lighter than hair.

ANCESTRAL AND FAMILY RECORD.

ANCESTRY.	AGES, LIVING.	AGES AT DEATH.	CAUSE OF DEATH.	COLLATERAL BRANCHES.	AGES, LIVING.	AGES AT DEATH.	CAUSE OF DEATH.
Pat'l G. F.,	87	Old age.	Pat'l Uncles,		94, 70, 70	62, 60	Old age, Croup, Fever, Measles.
" G. M.,	87	Old age.	" Aunts,		45		Dysentery.
Mat'l G. F.,	83	Tonsilitis.	Mat'l Uncles,	82, 75	84, 80		Fever, Paralysis.
" G. M.,	87	Old age.	" Aunts,	78, 79	60		Unknown.
Father,	74	Accident, Injury.	Brothers,	55, 52, 28	15, 14, 3		Abcess, Black Tongue, Dysentery.
Mother,	84		Sisters,		50, 16, 3		Milk-leg, Fever, Dysentery.

EXAMPLE 3.

NAME.	AGE.	MEASURES.					BEARD.
		HEIGHT.	TRUNK.	TEMPORAL FOSSE.	NASO- FRONTAL, AND AURAL.	POWELL'S LINE.	
F. L. S.	34	5 ft., 9 in.	25 in.	5 $\frac{1}{4}$ in.	5 in.	— in.	Lighter than hair.

ANCESTRAL AND FAMILY RECORD.

ANCESTRY.	AGES, LIVING. AGES AT DEATH.	CAUSE OF DEATH.	COLLATERAL BRANCHES.	AGES, LIVING.	AGES AT DEATH.	CAUSE OF DEATH.
Pat'l G. F.,	90	Old age.	Pat'l Uncles,	62, 65, 70		
“ G. M.,	92	Old age.	“ Aunts,		Un- known.	Unknown.
Mat'l G. F.,	85	Old age.	Mat'l Uncles,	60 to 70 (3)		
“ G. M.,	80	Old age.	“ Aunts,	60, 66		
Father,	73		Brothers,			
Mother,	70		Sisters,	33 to 40 (4)		

EXAMPLE 4.

NAME.	AGE.	MEASURES.					BEARD.
		HEIGHT.	TRUNK.	TEMPORAL FOSSE.	NASO- FRONTAL, AND AURAL.	POWELL'S LINE.	
A. S. C.	48	6 ft., 1 in.	27 $\frac{1}{2}$ in.	5, 5-16 in.	4 $\frac{3}{4}$ in.	1 $\frac{1}{2}$ in.	Like hair.

ANCESTRAL AND FAMILY RECORD.

ANCESTRY.	AGES, LIVING. AGES AT DEATH.	CAUSE OF DEATH.	COLLATERAL BRANCHES.	AGES, LIVING.	AGES AT DEATH.	CAUSE OF DEATH.
Pat'l G. F.,	73	Old age.	Pat'l Uncles,		75 to 80 (4)	Old age.
“ G. M.,	76	Old age.	“ Aunts,		90	Old age.
Mat'l G. F.,	59	Injury.	Mat'l Uncles,		58, 85	Fever, Old age.
“ G. M.,	81	Old age.	“ Aunts,		80	Unknown.
Father,	74	{ Liver dif- ficulty.	Brothers,	56, 58	52, 30	Consumption, Peritonitis.
Mother,	53	{ Consump- tion.	Sisters,	40	44	Dropsy.

EXAMPLE 5.

NAME.	AGE.	MEASURES.					BEARD.
		HEIGHT.	TRUNK.	TEMPORAL FOSSÆ.	NASO- FRONTAL, AND AURAL.	POWELL'S LINE.	
J. A. A.	21	5 ft., 10 $\frac{1}{2}$ in	24 $\frac{1}{2}$ in.	5 $\frac{1}{2}$ in.	5 in.	— in.	Darker than hair.

ANCESTRAL AND FAMILY RECORD.

ANCESTRY.	AGES, LIVING.	CAUSE OF DEATH.	COLLATERAL BRANCHES.	AGES, LIVING.	AGES AT DEATH.	CAUSE OF DEATH.
Pat'l G. F.,	70		Pat'l Uncles,	None.	None.	
" G. M.,	70	None Dead.	" Aunts,	None.	None.	
Mat'l G. F.,	74		Mat'l Uncles,	25 to 47		
" G. M.,	74		" Aunts,	38		
Father,	47		Brothers,	12, 21		
Mother,	44		Sisters,	23		

*Great G. Parents all
died over 90 years.*

EXAMPLE 6.

NAME.	AGE.	MEASURES.					BEARD.
		HEIGHT.	TRUNK.	TEMPORAL FOSSÆ.	NASO- FRONTAL, AND AURAL.	POWELL'S LINE.	
M. G. D.	48	5 ft., 10 in.	27 in.	6, 1-16 in.	5 $\frac{1}{4}$ in.	— in.	Lighter than hair.

ANCESTRAL AND FAMILY RECORD.

ANCESTRY.	AGES, LIVING.	CAUSE OF DEATH.	COLLATERAL BRANCHES.	AGES, LIVING.	AGES AT DEATH.	CAUSE OF DEATH.
Pat'l G. F.,	100	Old age.	Pat'l Uncles,	78, 70		
" G. M.,	104	Old age.	" Aunts,	70	39	Child-birth.
Mat'l G. F.,	90	Old age.	Mat'l Uncles,	70	48	Cholera.
" G. M.,	70	Old age.	" Aunts,	80, 70		
Father,	100		Brothers,	46, 57, 59		
Mother,	80		Sisters,	44, 61		

EXAMPLE 7.

No. 404.—1873.

NAME.	AGE.	MEASURES.					BEARD.
		HEIGHT.	TRUNK.	TEMPORAL FOSSÆ.	NASO- FRONTAL, AND AURAL.	POWELL'S LINE.	
A. A. M.	23	5 ft., 7 $\frac{1}{2}$ in.	25 in.	5 $\frac{1}{4}$ in.	5 in.	1 in.	Lighter.

ANCESTRAL AND FAMILY RECORD.

ANCESTRY.	AGES, LIVING.	AGES AT DEATH.	CAUSE OF DEATH.	COLLATERAL BRANCHES.	AGES, LIVING.	AGES AT DEATH.	CAUSE OF DEATH.
Pat'l G. F.,	95	Old age.	Pat'l Uncles,	65, 55	67		<i>Unknown.</i>
" G. M.,	90	Old age.	" Aunts,	58			
Mat'l G. F.,	104	Old age.	Mat'l Uncles,	65 to 80		6	Living.
" G. M.,	85	Old age.	" Aunts,	60, 70			
Father,	60		Brothers,	18 to 34		7	Living.
Mother,	60		Sisters,	20 to 35		4	Living.

EXAMPLE 8.

No. 410.—1873.

NAME.	AGE.	MEASURES.					BEARD.
		HEIGHT.	TRUNK.	TEMPORAL FOSSÆ.	NASO- FRONTAL, AND AURAL.	POWELL'S LINE.	
H. H. B.	46	6 ft.	28 $\frac{1}{2}$ in.	5 $\frac{1}{4}$ in.	5 in.	— in.	Lighter.

ANCESTRAL AND FAMILY RECORD.

ANCESTRY.	AGES, LIVING.	AGES AT DEATH.	CAUSE OF DEATH.	COLLATERAL BRANCHES.	AGES, LIVING.	AGES AT DEATH.	CAUSE OF DEATH.
Pat'l G. F.,	94		Pat'l Uncles,	98			
" G. M.,	92		" Aunts,	85			
Mat'l G. F.,	90		Mat'l Uncles,	68			
" G. M.,	74		" Aunts,	<i>None.</i>			
Father,	86		Brothers,	40 to 45		4	Living.
Mother,	84		Sisters,	34, 36		2	Living.

In contrast with the foregoing examples, the few following are given as illustrating the indication of inferior short-lived ancestry by the uniformly shorter measures. In these latter will also be observed the deaths at early ages among the immediate relations and ancestors, and the train of constitutional or transmissible diseases which seem to have cut short the stock.

Many more examples, of both kinds, might be added from the records, did time and space admit, but sufficient are here given to illustrate the reliability of accurate measurement of the head and trunk, to show that in these biometrical indications we can find such data that, in connection with other more general indications, it is possible to point out to individuals their ancestral ages with very great accuracy, independent of any statements from them.

Examples of Small Head and Trunk Measures,
indicating Short-lived Ancestry.

EXAMPLE 1.

No. 107.

NAME.	AGE.	MEASURES.						BEARD.
		HEIGHT.	TRUNK.	TEMPORAL FOSSEÆ.	NASO- FRONTAL, AND AURAL.	POWELL'S LINE.		
F. W. M.	21	5 ft., 8 in.	24 in.	5½ in.	4¾ in.	— in.	Lighter.	

ANCESTRAL AND FAMILY RECORD.

ANCESTRY.	AGES, LIVING. AGES AT DEATH.	CAUSE OF DEATH.	COLLATERAL BRANCHES.	AGES, LIVING.	AGES AT DEATH.	CAUSE OF DEATH.
Pat'l G. F.,	68	<i>Unknown.</i>	Pat'l Uncles,	45	25	Consumption.
" G. M.,	—		" Aunts,	55	42	Cancer.
Mat'l G. F.,	50		Mat'l Uncles,	48, 35	33	Carbuncle.
" G. M.,	48		" Aunts,	32 to 45	42, 30	Typhoid fever.
Father,	48		Brothers,	18, 8	5, 1	Scarlet fever.
Mother,	40	{ Consumption.	Sisters,	24, 17		

EXAMPLE 2.

No. 1137.

NAME.	AGE.	MEASURES.					
		HEIGHT.	TRUNK.	TEMPORAL FOSSÆ.	NASO- FRONTAL, AND AURAL.	POWELL'S LINE.	BEARD.
R. S. L.	41	5 ft., 8 $\frac{1}{2}$ in.	23 in.	5, 3-8 in.	4 $\frac{1}{2}$ in.	$\frac{3}{4}$ in.	Darker.

ANCESTRAL AND FAMILY RECORD.

ANCESTRY.	AGES, LIVING.	AGES AT DEATH.	CAUSE OF DEATH.	COLLATERAL BRANCHES.	AGES, LIVING.	AGES AT DEATH.	CAUSE OF DEATH.
Pat'l G. F.,	66		Apoplexy.	Pat'l Uncles,		76	
" G. M.,	76		{ Inflamm- ation.	" Aunts,	31, 37		Liver complaint.
Mat'l G. F.,	60		{ Consump- tion.	Mat'l Uncles,		27	Consumption.
" G. M.,	70		Fever.	" Aunts,	1 to 57		{ 3 of Consumption. 1 of Quinsy and Measles.
Father,	69			Brothers,	38, 32	16 days.	
Mother,	68			Sisters,			

EXAMPLE 3.

No. 304.

NAME.	AGE.	MEASURES.					
		HEIGHT.	TRUNK.	TEMPORAL FOSSÆ.	NASO- FRONTAL, AND AURAL.	POWELL'S LINE.	BEARD.
J. A. S.	21	5 ft., 8 $\frac{1}{2}$ in.	24 in.	5, 3-8 in.	4 $\frac{1}{2}$ in.	— in.	Lighter.

ANCESTRAL AND FAMILY RECORD.

ANCESTRY.	AGES, LIVING.	AGES AT DEATH.	CAUSE OF DEATH.	COLLATERAL BRANCHES.	AGES, LIVING.	AGES AT DEATH.	CAUSE OF DEATH.
Pat'l G. F.,	65			Pat'l Uncles,	55	55	
" G. M.,	65			" Aunts,	63		
Mat'l G. F.,	—	Unknown.		Mat'l Uncles,	60 to 65		3 Living.
" G. M.,	—	Unknown.		" Aunts,		60, 50	Cancer.
Father,	60			Brothers,	33		
Mother,	63			Sisters,	28	30	Tumor.

COLOR.—Good health is generally accompanied by the roseate tint peculiar to a well-nourished body. Any departure from what may be termed the normal physiological color of the skin, indicates either some derangement of the internal organs, or some external injury; some pathological condition. For instance, the peculiar yellow of jaundice indicates some hepatic difficulty; the pale anaemic aspect, chlorosis; the brownish yellow, bruised or externally injured parts. So also in the different temperaments we have the brownish tawny skin of the bilious, the fair light complexion of the sanguine, and the paler shade in the nervous, when either of these predominate. General debility is usually accompanied by a pale waxy tint, while inflammatory or congestive conditions give us increased redness, even to lividity.

With some exceptions we find the rule to be, that sound, vigorous health is indicated by a roseate tinted skin, showing the circulation of blood possessing normal constituents in due proportions, such as only a good physiological organism can furnish.

Ill health, systemic obstructions, congested capillaries or biliary derangements produce general discoloration, and may be looked upon as indications of grave import, while local changes may only indicate transient ailment or injury of the special part. A pale, waxy cuticle, if accompanied with oedema, and congested capillary vessels about the nasal alæ, usually indicates renal disturbance, which may often thus be diagnosed even before the presence of albumen is detected in the urine.

The colors of the iris, as before remarked, are, strictly speaking, either blue or brown, presenting every variety of shade, whose perfect admixture produces the true hazel. The color of the iris never changes in the individual except as to shades, and presents one of the strongest indications of the original fundamental constitution. Thus the two temperaments, bilious and sanguine, are well represented; the first by the brown, the second by the blue. The former venous, sluggish; the latter, arterial, quick. In the pure hazel we find these two grand temperaments well blended, nearly always associated with vigorous, healthy long life.

Either of these colors may be found in aged persons, however, as may be observed in some of the different races; for instance, the black hair, dark brown eyes, dark bilious complexion, and dark beard of the Jewish race, or the light blue eyes, Saxon hair, and fair complexion of the German and Scotch races. As a rule, when the iris looks watery, weak, color thin or transparent, either brown or blue, there may be a suspicion of defective constitution; while a pure, deep bright color is a strong indication of vigorous life. Very dark hair and beard, with light eyes and pale skin, show scrofulous and consumptive tendencies.

The colors of the hair, beard, eyes and skin compared, will then present good indications of health and disease, as well as of personal and ancestral longevity. Dark red hair and beard indicate nearly the same bilious temperament as dark brown or black hair with brown eyes, and with the

same tendencies to diseases of the liver and digestory organs, and their usually attendant consequences, piles, rheumatic and systemic affections. When the eyes are of a reddish brown tint, easily lighted up under excitement, caused by a more rapid circulation, we have the most decided indication of a tendency to apoplexy, liability to sun-stroke or sudden cerebral congestion, and, as in these temperaments there is usually less muscular tenacity of blood vessels, it is with such that the smaller blood vessels give way under pressure from undue excitement or continuous mental activity. It has also been remarked that comparatively few persons with pure brown eyes can be found living above 70 years of age. Usually they do not live beyond 60 to 65. On the other hand, it is rare to find persons over the age of 70, who have not pure hazel eyes.

We have now given, somewhat in detail, the three grand divisions of the indications which can be applied, biometrically, to the study of the probabilities of life. In addition to these personal indications and measures, a record or inquiry in respect to the class of ancestral diseases, with the natural tendencies thereto, will afford such knowledge as heredity exhibits.

For the practitioner, the study of these biometrical indications in connection with an inquiry into the family history, their diseases and the causes of death, will be found of very great value.

The tendencies to some special disease may be guarded against, since the prognosis may be prevised and the diagnosis determined with much accuracy, and the treatment thereby intelligently directed.

For the practice of medicine and surgery, we then have certain indications and measures that can afford data by which a probable prognosis may be reached in cases of much gravity. With a history showing long-lived healthy ancestors, with form, color, and measures corresponding, by which we are enabled to judge of the kind and quality of the constitutional inheritance, a proper estimate of the amount of endurance is possible, and one can, with very great confidence, assure the desponding, cheer the faint-hearted, and carry along the debilitated and almost exhausted patient to a successful recovery.

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